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10/808,691	03/25/2004	John William Kostenko	FKL-017	6065

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EXAMINER

CHAUDHRY, SAEED T

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1792

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ELECTRONIC

Please find below and/or attached an Office communication concerning this application or proceeding.

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DETAILED ACTION

Applicant's amendments and remarks filed January 11, 2007 have been acknowledged by the examiner and entered. Claims 25-27, 30-31 and 44-45 have been canceled and claims 1-24, 28-29, 32-37 and 42-43 are pending in this application, Of the above 6-7, 14-24, 28-29, 32-37 and 38-43 are withdrawn for consideration.

Applicant is advised that should claims 2-5 be found allowable, claims 10-13 will be objected to under 37 CFR 1.75 as being a substantial duplicate thereof. When two claims in an application are duplicates or else are so close in content that they both cover the same thing, despite a slight difference in wording, it is proper after allowing one claim to object to the other as being a substantial duplicate of the allowed claim. See MPEP § 706.03(k). Claim 1 and claim 10 have same limitation of "applying RF power to the process tube" since claim 1 has limitation selected from the group, and claim 2 depends from claim 1, which still read on the claim 10.

Claim Rejections - 35 USC § 112

Rejection under 35 U.S.C. § 112, first paragraph has been withdrawn by the examiner in view of amendments to the claims.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

The factual inquiries set forth in *Graham v. John Deere Co.*, 148 USPQ 459, that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or unobviousness.

Claims 1 and 8 are rejected under 35 U.S.C. § 103(a) as being unpatentable over Kokichi in view of Blalock.

Kokichi (JP-62-196820) discloses a method for cleaning a batch type processing system by introducing a cleaning gas into the reaction pipe and forming a plasma by applying high frequency voltage to electrodes. RF electrodes are arranged along the outer circumference of the reaction pipe. The reaction pipe hold plurality of semiconductors in a vertical stack (see fig. 4) and exhausting reaction product from line 8 (see abstract and figs).

Blalock (5,514,246) discloses a method of cleaning material adhering to internal walls of a plasma reactor, after dry etching a wafer by injecting an etching gas into the reactor and applying electrical current to inductive coils to ionize the etching gas into a plasma, the method comprising the following steps: injecting a cleaning gas into the reactor, the cleaning gas comprising a species which when ionized is reactive with material adhering to the internal plasma reactor walls; applying radio frequency power to the electrostatic barrier plate to produce an electrostatic capacitive coupling effect between the electrostatic barrier plate and another conductor which is effective to both ionize the cleaning gas into the reactive ionized species and draw such ionized species in the direction of the external conductor to impact and clean away material adhering to the reactor internal walls.

A plasma reactor apparatus in accordance with the invention is indicated generally by reference numeral 10. Such comprises an electrically insulative shell 12 having internal walls 14. Walls 14 define an internal reactor cavity 16. An example material of construction for shell 12 would be quartz. Electrically conductive inductive coils 18 are positioned externally of

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cavity 16 and shell 12, and wrap therearound. Inductive coils 18 constitute an inductive coupling means positioned externally of cavity 16 for inductively generating and transmitting electromagnetic radiation into reactor cavity 16 to ionize gases therein into a plasma state. Coils 18 are powered by a suitable conventional power supply 20. An example power supply would be 13.56 MHz and 3000 watts. An internal electrode 22 is utilized for supporting a wafer (not shown), and is as well connected to a conventional capacitively coupled bias power source 24 which would be utilized when anisotropically etching.

A capacitive coupling plate 26 is positioned externally of cavity 16 and shell 12 intermediate cavity 16 and inductive coils 18. Capacitive coupling plate 26 is connected via a conductive line 28 to a switch 30. Switch 30 is operable to connect plate 26 to one of a ground source/potential 32 or a power source 34. Power source 34 would be configured for operating at a frequency from 100 kHz to 60 MHz. Line 28, switch 30 and power supply 34 comprise a capacitive coupling means positioned externally of cavity 16 for capacitively generating and transmitting electromagnetic radiation into the reactor cavity to ionize gas therein into a plasma state, and for drawing plasma ions in the direction of the capacitive coupling means to impact and clean material adhering to reactor cavity internal walls 14. Such provides but one example of a capacitive coupling means. Others are of course also contemplated in accordance with the invention. By way of example only, capacitive coupling means may be provided wherein plate 26 is positioned other than intermediate cavity 16 and coils 18. The material being cleaned comprises SiO_2 , the species within the cleaning gas comprising a fluorine gas selected from the group consisting of NF_3 , SF_6 or CF_4 . (see col. 1, lines 26-45, col., 3, line 1 through col. 4, line

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34). The reference fails to disclose a process tube for holding plurality of wafers in a vertical stack.

It would have been obvious at the time applicant invented the claimed process to apply RF power to the system components inside of the process tube or to the process tube as disclosed by Blalock into the process of Kokichi. This is because both the references are cleaning inside walls of the process chamber. One of ordinary skill in the art would expect that walls of the process chamber for holding single substrate or plurality of substrate would be cleaned with the same process as of a single substrate. Blalock discloses to have power connected to the tube walls and the inside of the components. Therefore, one of ordinary skill in the art would manipulate the power supply to inside components or the walls for removing material from the surface to be cleaned.

Claim 9 is rejected under 35 U.S.C. § 103 as being unpatentable over Kokichi in view of Blalock as applied to claims 8 and 16 above, and further in view of Hatano et al.

Kokichi and Blalock were discussed supra. However, the references fail to disclose to add diluting gas in the cleaning gas.

Hatano et al (5,709,757) disclose a method of cleaning chamber by forming plasma in the chamber with cleaning gases. When the fluorine-based gas is used as cleaning gas, the reactivity may be controlled by diluting the cleaning gas or alcohols used in the after-treatment by adding thereto a nitrogen gas or an inert gas, for example, helium (He), neon (Ne), argon (Ar), krypton (Kr), xenon (Xe) or radon (Rn) (see abstract and col. 5, line s 1-6).

It would have been obvious at the time applicant invented the claimed process to include a diluting gases as disclosed by Hatano et al into the process of Kokichi for purpose of manipulating the reactivity of the cleaning gases.

Claims 2-4, 10-12 and 16 are rejected under 35 U.S.C. § 103 as being unpatentable over Kokichi in view of Blalock as applied to claims 1 above, and further in view of Parkhe et al.

Kokichi and Blalock were discussed supra. However, the references fails to disclose a step of monitoring a signal for stopping of continuing a cleaning process.

Parkhe et al (5,886,865) disclose a method for monitoring a signal of the progress of the cleaning in a process chamber, which determine an intensity level of a signal reached at a threshold value and transmit the cleaning status to a controller. Based upon the signal, the controller 106 performs one of the following : 1, continue performing the cleaning process and continue monitoring; or 2, stopping the cleaning process after determining that the threshold value has been reached (see col. 4, lines 58-63 and col. 6, lines 61-65).

It would have been obvious at the time applicant invented the claimed process to incorporate the cited steps of monitoring the cleaning process as disclosed by Parkhe et al into the process of Kokichi for automatically performing the cleaning process and to avoid an over etch the surface.

Claims 5 and 13 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kokichi in view of Blalock and Parkhe et al as applied to claim 2 and 10 above, and further in view of Ghanayem et al et al.

Kokichi and Blalock and Parkhe et al were discussed supra. However, the references fail to use an optical monitoring by light emission.

Ghanayem et al (6,174,373) disclose a method of determining an endpoint of a plasma cleaning process by measuring spectral emissions of a glow discharge of the plasma (see col. 4, lines 7-13).

It would have been obvious at the time applicant invented the claimed process to incorporate the cited steps of monitoring end point of a plasma cleaning process by light emission as disclosed by Ghanayem et al into the process of Hattori et al for the purpose of stopping the cleaning process.

Claim 17 is rejected under 35 U.S.C. § 103 as being unpatentable over Kokichi in view of Blalock as applied to claims 1 above, and further in view of Hatano et al.

All of the reference were discussed supra. It would have been obvious at the time applicant invented the claimed process to include a diluting gases as disclosed by Hatano et al into the process of Kokichi for purpose of manipulating the reactivity of the cleaning gases.

Applicant's arguments with respect to claims 1-5, 8-13 and 16-17 have been considered but are deemed to be moot in view of the new grounds of rejection.

Applicant's amendment necessitated the new grounds of rejection. Accordingly, THIS ACTION IS MADE FINAL. See M.P.E.P. § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 C.F.R. § 1.136(a).

A SHORTENED STATUTORY PERIOD FOR RESPONSE TO THIS FINAL ACTION IS SET TO EXPIRE THREE MONTHS FROM THE DATE OF THIS ACTION. IN THE EVENT A FIRST RESPONSE IS FILED WITHIN TWO MONTHS OF THE MAILING DATE OF THIS FINAL ACTION AND THE ADVISORY ACTION IS NOT MAILED UNTIL AFTER THE END OF THE THREE-MONTH SHORTENED STATUTORY PERIOD, THEN

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THE SHORTENED STATUTORY PERIOD WILL EXPIRE ON THE DATE THE ADVISORY ACTION IS MAILED, AND ANY EXTENSION FEE PURSUANT TO 37 C.F.R. § 1.136(a) WILL BE CALCULATED FROM THE MAILING DATE OF THE ADVISORY ACTION. IN NO EVENT WILL THE STATUTORY PERIOD FOR RESPONSE EXPIRE LATER THAN SIX MONTHS FROM THE DATE OF THIS FINAL ACTION.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Saeed T. Chaudhry whose telephone number is (571) 272-1298. The examiner can normally be reached on Monday-Friday from 9:30 A.M. to 4:00 P.M.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Mr. Michael Barr, can be reached on (571)-272-1414. The fax phone number for non-final is (703)-872-9306.

When filing a FAX in Gp 1700, please indicate in the Header (upper right) "Official" for papers that are to be entered into the file, and "Unofficial" for draft documents and other communication with the PTO that are for entry into the file of the application. This will expedite processing of your papers.

Any inquiry of a general nature or relating to the status of this application should be directed to the Group receptionist whose telephone number is (571) 272-1700.

Saeed T. Chaudhry

Patent Examiner

/Michael Barr/

Supervisory Patent Examiner, Art Unit 1792